POPULAR MECHANICS

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TELLS YOU HOW TO DO THINGS. WRITTEN SO YOU CAN UNDERSTAND IT

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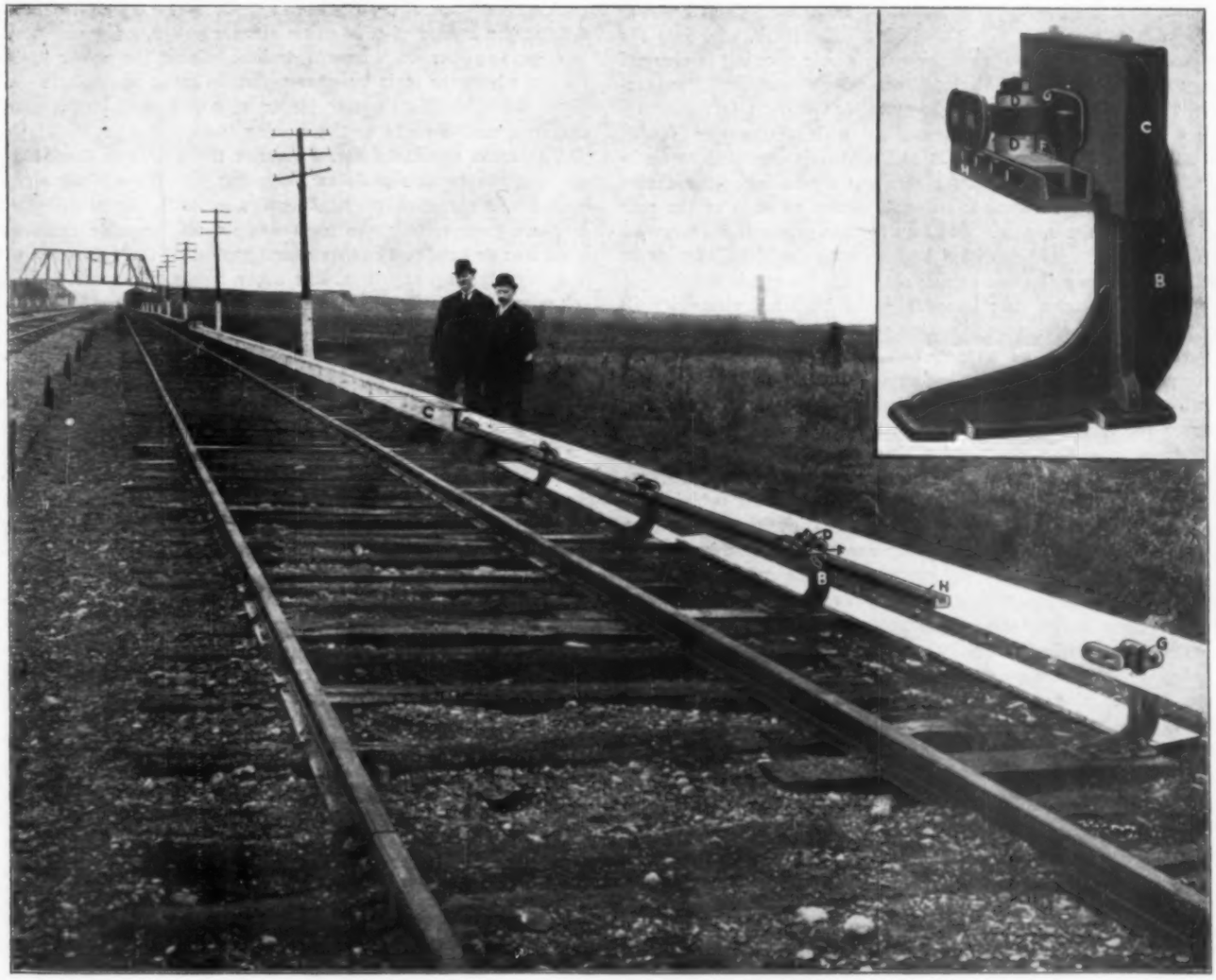
Latest High Speed Electric System



New Electric Power Feeding Device which May Revolutionize Railway Traffic

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Marks a New Era in Electric Traffic

New System, Which Does Away With Trolley Wire and Third Rail, May Become Universal

Electricity as a universal means of transportation may be the result of a very remarkable invention of a Chicagoan by which the trolley wire and the third rail are both dispensed with. To practically demonstrate the feasibility of the new system this Chicagoan has constructed a half mile of track near Chicago and is operating thereon a street car nearly the size of a passenger coach. Many have witnessed the operation of the device and many have ridden on the car and all claim that it marks a new era in traffic and make the prediction that the day is not far distant when it will supplant all other methods of transportation.

The cars are propelled by means of an incased electric power feeder which extends along the side of the track, and only the section of the feeder along which the car is running is charged at the time, all other sections remaining "dead." These sections may be of any desired length. The current is turned on by a controller device in connection with the power feeder located at convenient intervals and which is operated mechanically by the car as it enters a section. By an ingenious device the current is turned off from each section as soon as the rear wheels leave the section. Thus as the car proceeds it leaves an entirely "dead" feeder behind and an entirely "dead" feeder in front, save along the one section on which the car is moving.

All the obstacles that have hitherto hindered electricity in competing with steam as a motive power seem to have been removed at one fell swoop by this simple yet ingenious contrivance. It is capable of a higher speed than any other electric system; the saving as a result of having only one section of the power feeder charged at a time amounts to 30 per cent of the generated power as compared with other electric transportation systems; the power feeder and primary feed wires being securely incased, there seems to remain no possibility of collision or other source of danger; this, also, insures positive protection from the elements, and the cars may run as smoothly during the severest snow, sleet or rain storm as in the calmest day in August; it costs less to install the system and less to operate and maintain it than any other known; speed is attained with an ease that greatly lessens the running time; there is no smoke, cinders or dirt to combat with in the operation and it is freer from sources of dirt than any other means of traffic; these many advantages insure a remarkable saving in labor, fuel and repairs; all damages from lightning are absolutely obviated owing to the complete protection of all the feeders; there is no delay and interference from broken or ice covered trolley wires or third rails; there is a remarkable saving in cost at every step; saving in the cost of installation, saving in the cost of operation and maintenance, saving in power by its positive insulation and non-exposure to the elements and consequent saving in labor.

The inventor is E. W. Farnham, former superintendent of the Burlington railroad. The electric line, constructed to demonstrate the practicability of the new system, is located beside the Burlington road at Clyde, a suburb of Chicago. Here a test was given Friday, July 11, in the presence of electric traffic men, railway men, prominent electrical engineers and a representative of Popular Mechanics. Over the track the car containing the party sped along rapidly and smoothly as a passenger coach. The feeder of this line is divided into sections of different lengths to illustrate the application. At the end of each section an electric blocking signal is surmounted on an iron post. The signals are incased in weather-proof shields with glass of circular form on each side, not unlike the face of a clock. On one side they display a large red light and on the other a green, the lights being produced by a circular rim of incandescent lights on each side.

As the car moved the spectators were permitted to witness that when the car left a certain section, the power on that section was instantly turned off. Simultaneously the signal lights on that section would go out; the signals appearing only at the ends of sections charged and in use by the car. The car as it moved left an absolutely "dead" feeder behind it beyond the section on which it was running. At first the spectators looked on with amazement and wonder but when the device and its workings were unfolded to them and they were permitted to examine the methods by which the system was operated, it seemed so simple that all wondered why others had not thought of it before.

"You see," said Mr. Farnham in explaining the operation, "the system is a means of conducting electric power, anywhere up to 4000 horse-power, to a moving train, applying the power in the section where the train happens to be; in other words it is simply a safety sectional power feeder of any desired length made operative mechanically by the moving train.

"The same operation that furnishes the power to the feeder operates the block signals and crossing signals—a block signal behind and ahead of the train and a crossing signal ahead of it—thereby protecting the train against all possible accidents from rear or head end collisions and protecting the public against highway crossing accidents. In other words, whenever the car has power to run it, the section so charged is protected by signals, as are also, all highway crossings in that particular section."

The test the spectators were permitted to witness fully demonstrated all Mr. Farnham had said and more.

Commenting on the invention which is now attracting wide attention in the scientific world, the Chicago Commercial Chronic says:

"By this novel system the current is turned on to that section of the track over which the car or train is moving and an ingenious yet simple controller device operated automatically by the train, turns the power off the section when the rear wheels leave that part of the track.

"The opinion of the expert electrical engineers who have examined the sysem is that within a short time it is certain to supplant all other methods of supplying power to moving trains and cars."

Edison's new storage battery and all other late transportation inventions are obnubilated by this electric traction device of Mr. Farnham. Experts declare it to be the most important step of the new century in the advancement of traffic facilities. The deadly grade crossing and the numerous other sources of accident that have so long filled the hospitals of cities, and caused the loss of hundreds of lives and untold damage to the car companies may exist only in memory when the Farnham system becomes universal. It makes collisions virtually impossible and simplifies railway motive power to a degree which, six months ago, was not dreamed of by others than Mr. Farnham, who has been working on the device for three years. Already many roads have made arrangements for equipping entire systems with the Safety Sectional Power Feeder and ten years will probably witness the complete abolition of the steam locomotive, the electric trolley line and the deadly third rail systems.

Patents protecting the new system of transportation are owned and controlled by the Rapid Traction Construction Co., 521 Stock Exchange Bldg., Chicago.

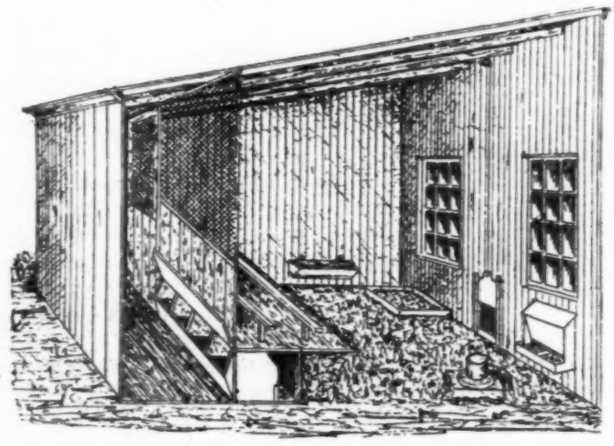
An Indiana man invents a device for use in barns, which acts when heat is occasioned by fire. It unhitches the horses and turns on a stream of water.

A recent invention is an arrangement like a lantern on which the bits of a bridle may be warmed in zero weather.

PRACTICAL POULTRY HOUSE.

The house shown is 10 by 13 feet, faces the south and is 8 feet high on the south side and 7 feet on the lower or north side. The description and cut are from the American Poultry Journal. The outside walls may be constructed of either double flooring or boards, with battens on the outside and tarred paper between. It is always well to leave a two-inch air space between the two walls if the inside ceiling of flooring is fitted tightly together and the outside cracks are closely battened, as the dead air space thus made will make the house warmer in winter and cooler in summer.

The passage, as shown in the illustration, has a board floor and the poultry room has a floor of dry earth. In winter this floor should be covered with short straw, leaves or clean litter of this kind, in which the grain that is fed should be thrown to keep the hens busy scratching in order to force them to take necessary exercise. The divisions between the poultry rooms and hallway, if there are more rooms than one, should be boarded about two feet above the floor, where there are no



Fine House for Hens.

roosts, and from there to the roof should be made of wire netting, as shown in the cut. The arrangement for nests is is shown in the illustration. This makes it convenient to gather the eggs from the hallway. The dusting box is placed where the sun can shine directly on it through one of the windows, and on the south wall is shown a hopper, in which is kept a supply of grit, while the water fountain or vessel stands before the other window in winter and in the coolest corner of the house in summer.

The perches are shown so plainly that no explanation is necessary, except to say that perches, dropping board, nest boxes and every other inside fixture should be so arranged that they can be taken out and cleaned without trouble at any time.

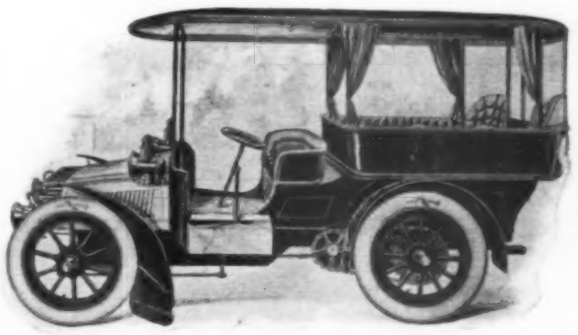
UNDERGROUND CARS PROPOSED FOR CHICAGO.

A system of subways six miles in length, to cost $35,000,000, is proposed to relieve the congestion of surface travel in the retail district in Chicago. The tunnels would be 30 feet below street surface and require four years to construct. Electricity would be the motive power.

England is now building scout ships of very great speed, with extremely tall masts for wireless telegraphy. The scout ship will try to locate the enemy and telegraph the fleet where to move.

KING EDWARD LIKES AUTOS.

It it to be hoped that King Edward will be able to use his new automobile, which will soon be completed. He has taken a great interest in the development and progress of the horseless carriage and has watched the progress of his new tonneau closely. It is a gasoline machine of 22 horse-power and has room for six passengers, besides the operator. There are four

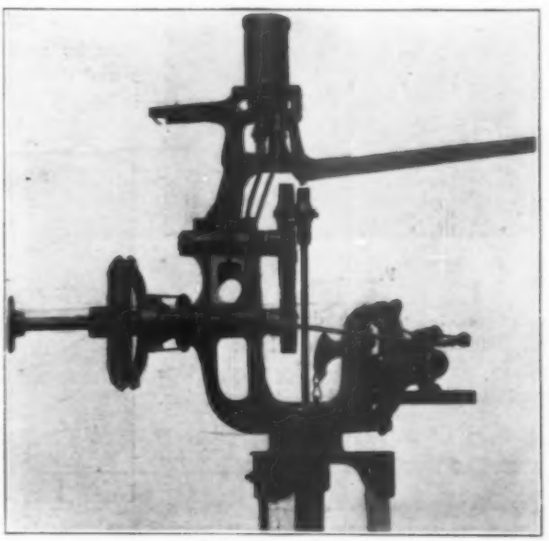


A King's New Auto.

forward speeds controlled by a lever while the reverse is accomplished by a pedal. The wheels are the standard 36-inch artillery pattern; wheel base 108 inches. The car is finished in red, and upholstered in blue morocco leather. For winter use it is inclosed in plate glass. Our illustration is from the Automotor Journal, London.

OILER FOR WIND MILLS.

More people are killed every year by falling from wind mills while oiling the machinery than are struck by lightning. It requires a cool head and steady nerves to climb a ladder 60



Wind Mill Oiler.

feet in air. A sudden gust of wind may cause the wheel to swing around and knock the workman from his hold. M. W. Taylor, of Iowa, has just invented an automatic oiler which requires filling only once in many months, and in which the flow of oil is regulated by the necessity.

A safety bottle has been invented for use in drug stores. In order to remove the stopper a small clip must be unfastened, in doing which a tag flies up bearing the word "poison" in large letters.

Latest Photographic Fad

Illustrating Songs with Lantern Slides

A new field of pleasure for the amateur photographer is described in the Photo-Beacon for July. The latest thing is the

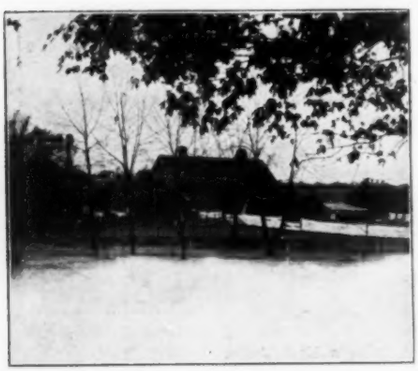


Fig. 1.

illustrating of songs with appropriate pictures. Lanterns can now be purchased at very reasonable prices and lend special interest to an evening's home entertainment during the winter. Of course, most of the

Fig. 2.

pictures must be taken during the summer. The work affords no limit to the imaginative ability of the operator. One example will give the idea full illustration.

Fig. 3.

The article relates the desire of an operator to illustrate these words:

The old red barn, the windmill nigh,
The pasture with its maple tree,
Beneath whose shade the cattle lie,
O "Home, Sweet Home" is this to me.

So he started out in the country to find a barn (to be colored red in the slide) with the cows resting under the leafy trees. He found the barn, but the cows could not be induced to recline on the pasture. So he took the barn. See Fig. 1. After driving a few miles he found the cows and photographed them. Fig. 2.

Fig. 4.

When he reached home he proceeded to unite the two in one picture, which was done by removing the upper part of Fig. 2 and the lower part of Fig. 1, as shown in Fig. 3 and Fig. 4. The process of coloring and binding the two plates is then fully described in the Photo-Beacon, and is a somewhat delicate process, but can be done with some practice. The final result is shown in Fig. 5, which completely illustrates the words of the song, even to the windmill.

Fig. 5.

A copper tube of ordinary thickness, and one inch internal diameter should stand heat up to 700 degrees.

FIRE ENGINE GOES TO THE BOTTOM OF THE MISSISSIPPI.

Remarkable Feat of Rescue Performed in Presence of Big Crowd by a Diver and Wrecking Boat.

A huge fire engine, which slipped and went to the bottom of the Mississippi river, while at work on a burning steamer a few days ago, was taken out intact in less than four hours. The incident was witnessed by a large crowd, which gathered to see the burning of the vessel. The horses had been unhitched and the engine was being backed down the wharf by hand when the skids that held it slipped, and with a great splash it plunged into the river. It was a double-pump engine, built by the American Fire Engine Company, of Cincinnati, O., and weighed 8,400 pounds. There was a suppressed cry of awe from all the crowd when the big machine went down. The successful recovery was accomplished by the aid of a diver and a wrecking boat of the Morgan Line. The diver found the engine in 35 feet of water. The Fireman's Herald says:

"The diver fastened slings to each of the four wheels and lowered two falls, one on the rear wheels and one on the front ones, and then started the machinery, and the derrick brought the engine up slowly and carefully, and when it was out of the water it was a very pretty sight, the great engine hanging there in the slings in the grasp of the huge derrick, capable of lifting fifty tons. The horse collars and harness were on the foot-board, and the driver's seat with the whip in the socket. The engine was brought up intact just as it went over the edge of the wharf on its terrific plunge, and, as far as could be discovered, not a particle of the machine was in the least injured."

SULPHUR UNEQUALED FOR MATCHES.

The Belgian government, in 1898, announced an international competition for paste for matches not containing white sulphur, and a prize of 50,000 francs ($9,650) was offered to the inventor. The commission appointed to judge results has now declared that after four years of careful experiment and analysis, it has been found that none of the products so far submitted fill the required conditions, being defective in inflamability, igniting on all surfaces, or, in igniting, ejecting inflammable matter containing some poisonous substance. The sum already expended in the matter amounts to 8,178 francs ($1,578.35). This covers cost of printing, correspondence with foreign countries, purchase of material, analysis and experiments.

DIDN'T WANT TO LOSE HIS JOB.

"In the early days in the mountainous west, brakemen were scarce," said an old-time engineer of Denver, "and we used to pick up a man once in a while along the road and put him to work brakin' at so much a mile. I remember one day we got hold of a new Irishman and put him to work on a construction train at three cents a mile. We hadn't gone far when somehow the train got away on one o' them mountain grades, and the first thing we knowed she was flying down the track at about ninety miles an hour, with nothin' in sight but the ditch and the happy huntin' grounds when we come to the end. I twisted 'em down as hard as I could all along the tops, and then of a sudden I see Mike crawlin' along towards the end of one of the cars on all fours, with his face the color of milk. I thought he was gettin' ready to jump, an' I see his finish if he did.

"'Mike,' I says, 'for God's sake don't jump.'

"He clamps his fingers on the runnin' board to give him a chance to turn round, and, lookin' at me contemptuous, answers:

"'Jump, is it? Do yez think I'd be afther jumpin' an' me makin' money as fast as I am?'"

MAKE VIOLINS AND MANDOLINS OF CLAY.

Violins and mandolins made of clay are now being placed on the market in Europe and America. Many declare them to be superior to the time-honored wooden instruments. The clay is made into a high-grade porcelain, which forms the body of the mandolin or violin. The porcelain body, it is claimed, is better capacitated for producing sound than a wooden one, since it co-operates in the making of sound, causing the notes to become soft and full. A further advantage claimed is that the porcelain instrument is totally insensible of the influence of the weather.

WOOD ALCOHOL IS POISON.

Dr. Reid Hunt, of Johns Hopkins Hospital, from experiments made by himself and others, concludes that wood alcohol, which has been the cause of so much blindness and even deaths in this community in the last two years, is itself a poison, and that its poisonous properties are not due to the impurities present in it, as is often claimed.

FILLING GASOLINE TANKS IN LAUNCHES.

When a tank in a launch is filled with gasoline, the rich vapor which is driven out of the tank settles and finds its way about the boat beneath floor or deck and the hull. It is highly explosive and dangerous, long after the filling is finished, and explains many mysterious explosions. F. I. Hitchcock, of Bridgeport, Conn., in the Automobile and Motor Review, tells how he prevents such accidents. Fig. 1 shows the gasoline tank in hull of boat, nearly empty, the dotted portion of the cut indi- and 24 inches wide. Our illustration is

FIG. 1

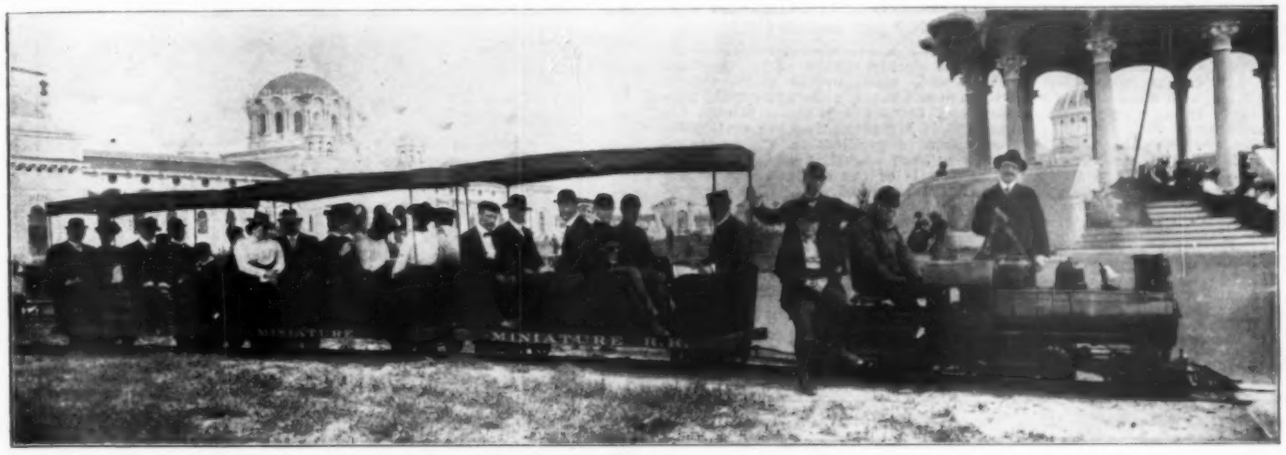
FIG 2

FIG. 3

cates gas. Fig. 2 shows the usual manner of filling through a hose and the escape and fall of gas around the tank. Fig. 3 shows a pipe which screws into the tank opening and in which the hose is inserted. The pipe forms a stack through which all escape of gas is carried into the air and entirely free from the boat.

SMALLEST RAILROAD IN THE WORLD.

A flea a foot long or an elephant a foot high would attract thousands of people. On this principle, doubtless, a company in New York has engaged in the manufacture of minature steam railroads. The engine and tender are only 9 feet long, while the passenger cars are 6 feet long



Miniature Railway at the Charleston Exposition.

from a photograph taken by the Street Railway Review. The baby trains which had their inception at the Charleston exposition are now employed as atractions at amusement resorts in Chicago and New York.

GREAT ALASKAN COAL FIELD.

The Chignik-Unga-Herendeen Bay coal mesures, the most extensive and accessible coal fields in Alaska, are destined to become of great importance to the United States and her new possessions. The coal in quality is ranked next to Kyak, standing in the front rank of North Pacific coals. Harrington Emerson in the Engineering Magazine says:

"The field is of unique value because of its location in the keystone of the North Pacific. Not only does the shortest possible steamer line from the United States or British Columbia run within 20 miles of this field but it is also the nearest of all American coal mines to all the island possessions of the United States on the Pacific."

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COMBINING TELEGRAPH AND TELEPHONE CIRCUITS.

At a recent meeting of the Dublin section of the Institution of Electrical Engineers, A. T. Kinsey described an interesting and ingenious method of combining telephone and telegraph circuits which run on the same pole line, so as to obviate inductive disturbance of the former, without more wires than would be required for a single wire circuit for each. The arrangement is

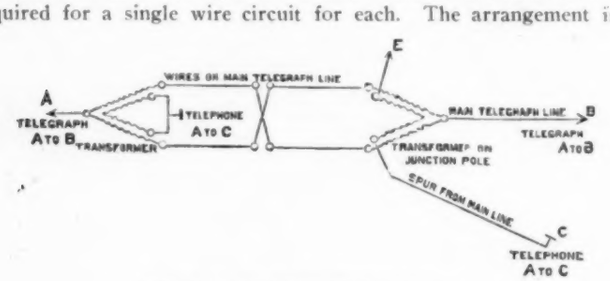


DIAGRAM OF LINE CONNECTIONS.

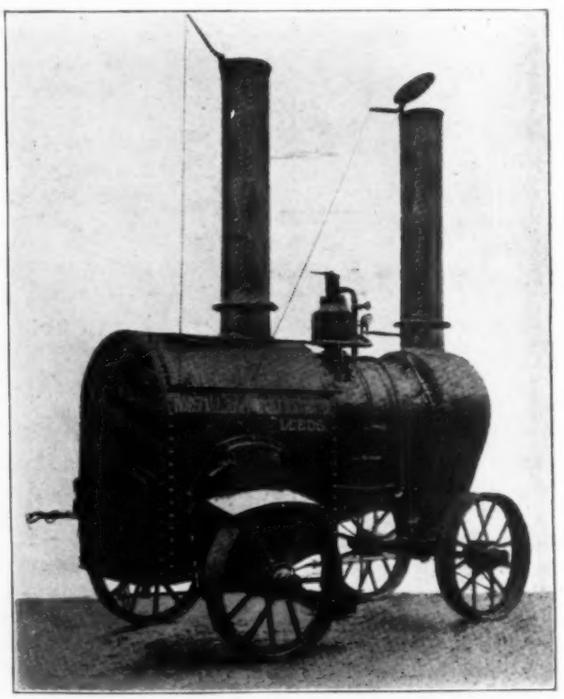
shown by the diagram. The two line wires are joined at each end through similar windings of two transformers, and the telegraph line is connected to the centers of the same windings at each end. The telephone sets are connected in the other windings of the respective transformers. If the telephone line wire is led off the line of poles carrying the telegraph wire, the transformer is placed at the junction pole and one end of the winding connected with the telephone is earthed there, the other end being connected to the continuation of the telephone line wire, and earthed through the telephone set as usual. The two line wires are in parallel so far as the telegraph currents are concerned, and the differential action of the transformer windings to these currents prevents disturbance to the telephone, which has a metallic circuit up to the transformer at the far end. Disturbance from other wires is prevented by crossing the line wires in the usual way. Obviously, the two line wires must have the same resistance in order to prevent disturbance of the telephone by the telegraph currents. The illustration is from the Electrical Review, London.

Norwegian fishermen use thermometers in catching cod, which are found in greatest numbers where the water is four or five degrees above freezing.

BURNING STREET REFUSE ON THE SPOT.

A firm in Leeds, England, is manufacturing a portable furnace for the destruction of street sweepings. The litter is gathered at convenient points and the destructor makes regular trips and burns it up. The Engineering Times, London, says:

"It has an arched fire-brick top with an opening at the front over the clinkering door, for the escape of the products of com-



Portable Refuse Destructor.

bustion. The furnace is provided with a patent steam jet forced draft. The machine has a steam boiler, the power from which can be used if desired. The boiler also supplies steam to the steam jet blowers, which force the fuel down upon the fire. The destructor carries its own water tank and injector. It may be drawn by two horses. The machine has a capacity of four tons per day. The auxiliary stack is used when more heat is made than is required in the boiler."

AUTOMOBILE HAULS PIG IRON.

Carries Six Tons at Six Miles an Hour—Thirty-five Horse-Power—Wheels Twelve Inches Wide.

An automobile has been built in Indianapolis on the heavy truck pattern, which easily hauls six tons of pig-iron at six miles an hour. The motor is of 35 horse-power and will take the load up the steepest hills in the city. The platform is 25 feet long and 8 feet wide, 6 feet of which is occupied by the engineer's cab. One man operates the vehicle with much less trouble than if drawn by horses. The wheels are very strong and have tires a foot wide.

ITALIAN STEAM RAILWAYS USE ELECTRICITY.

Two steam railways in Italy, each having about 3,600 miles of track, have begun changing their branch and feeder lines to electric. The same track is retained and trolley wires hung above. Several sections of main line track will also be operated by both steam and electric trains. The electric cars are for suburban passenger travel, the through passenger and freight trains being drawn by steam locomotives.

Easy Electrical Experiments
FOR BOYS

By L. P. Dickinson

CHAP. XXVIII.—THE MEASUREMENT OF RESISTANCE.

It is very often desirable to measure the resistance of various pieces of electrical apparatus, such as coils, and wires of various kinds. It is not at all difficult to construct a piece of apparatus which is capable of measuring resistances with a considerable degree of accuracy. The material needed for the construction of this apparatus is as follows,—a piece of pine board, 42 inches long, 8 inches wide, and ⅞ inch thick, a piece of No. 22 German silver or iron wire about a yard long, an ordinary wooden yardstick, a strip of brass or copper 4 feet long, ½ inch wide, and at least 1-32 of an inch in thickness, and five ordinary binding posts.

Cut the board to the dimensions given above, and smooth it

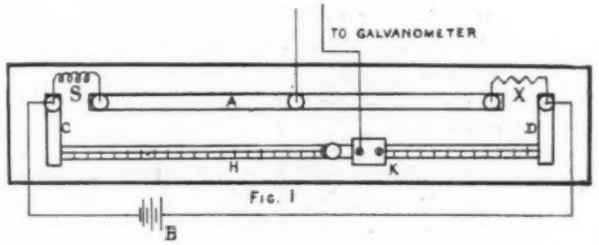


Fig. 1

off nicely with sand-paper. It is well to bevel the edges of the board for the sake of appearance. Near one edge of the board, and parallel with the edge, fasten the wooden yard-stick, as shown at H in Fig. 1. Three screws passing through the yard-stick and into the pine board will be sufficient.

Cut off two pieces of the brass strip each 5 inches long. These are to be fastened to the board at the end of the yard-stick, and are shown in the figure at C and D. The thickness of 1-32 inch given above for these strips, was chosen for the reason that this thickness would be easier to work for those possessing few tools. If possible, however, the thickness of all brass strips used should be 1-16 inch.

Now cut off another strip of brass whose length is 32 inches. This strip is shown at A in Fig. 1. It is screwed to the board so that it is in line with the end of strips C and D, and there is a 2-inch gap at S and X, as shown.

Put binding posts at the middle and ends of strip A, and also at the rear end of strips C and D, as indicated.

The next thing is to make the key shown at K in Fig. 1, and

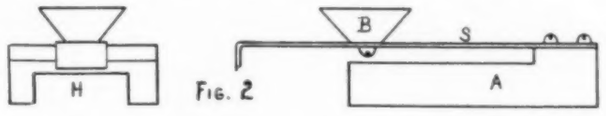


Fig. 2

shown enlarged in Fig. 2. The body of the key is made from a block of wood 2½ inches long, 1¾ inches wide, and ¾ inch thick. It is hollowed out on the under side as shown at H, so that it will fit snugly over the yard stick, and slide easily along the latter. On account of the different width and thickness of various yardsticks, it is impossible to give dimensions for the slot shown at H, but the amateur can easily arrange this.

The top of the block is cut down for a distance of ⅛ inch except for a distance of ¾ inch from one end. This end is left higher than the rest of the block so that the spring S may be fastened to the block in such a manner as to be capable of being moved freely upand down. In order to make it easy to press the spring downward, a wooden button B is screwed to the spring at a point just inside the end of the block. The spring S is made of a piece of 1-32 inch spring brass, and is bent over at right angles at one end as shown. The length of the long arm of this spring is 4 inches, and that of the short arm is 5-16 inch. The latter is beveled on its end to a sharp edge.

Now take a piece of German silver wire of the size already given, and a little longer than the yardstick. Stretch it lengthwise over the yard-stick, drawing it very smooth and tight along the surface of the latter, and clamping it firmly under the brass strips at the end. The wire should be very smooth and straight. Iron wire could be used, if it is impossible to obtain anything else, but it will give trouble, unless it is kept very carefully cleaned.

The key K when placed upon the stick, should slide very smoothly along the latter, and the brass spring should just clear the wire on the stick.

In using the apparatus, some form of sensitive galvanometer must be employed. Such a galvanometer was described in the second number of this paper. Another form will be described in the next paper. One terminal is connected to the binding post at the center of strip A, and the other terminal is connected by means of a long flexible wire to the key K.

At S is inserted a coil whose resistance is already known, and at X is inserted a coil or wire whose resistance we wish to determine. A battery of two or three cells is connected across from C to D as indicated at B.

The method of using the apparatus will have to be explained in the following paper.

THE CALLIOPE IS AN OLD INVENTION.

How One on a River Steamer Terrorized the Slaves in 1857.—Placed on the Market in 1850.

The steam calliope is not a new invention, as many suppose. It was invented by Josiah C. Stoddard, a native of Vermont, and was put on the market in 1850. One was used as an attraction at a circus at Fitchburg, Mass., in 1856. In Fitchburg on the same day there was a Republican rally to boom Fremont for president. There was great turmoil because of runaways and because the steam voiced instrument drowned the words of the speakers. Farmers came to town from all directions, saying they had heard the thing eight miles out in the country and they wanted to see what kind of a looking device it was that played in such a manner.

Consternation was spread among the Southern slaves, in 1857, when the steamer St. Nicholas, of New Orleans, equipped with a huge calliope made its way down the Mississippi from Memphis. The negroes said it was Gabriel blowing his horn. N. P. Nichols, a writer of that day, grew enthusiastic over the invention and the following from him appeared in the Home Journal:

"In the future churches, lofty chimneys will be subtstituted for steeples, engineers for organists, and the swelling devotion of the choir will be borne aloft, mingled with clouds of steam. Stationary engines in frequented spots will drive away the feeble organ grinders, and the supply of music will be limited only by the amount of fuel."

The organ in the State Street Episcopal church of Portsmouth, N. H., is the oldest in America. It was brought from England in 1713 and placed in King's chapel, Boston. Benjamin Franklin was then the organist. The organ is to be returned to Boston to be placed on exaibition.

Nails, staples and tacks, now made of an alloy of aluminum, are said to be superior to copper nails. They are not affected by the weather and will not deteriorate. The alloy is non-corrosive and non-poisonous. The new nails are about four cents a pound cheaper than copper nails.

SHOP NOTES

HOW TO UNITE CAST IRON.

To unite ordinary cast iron is not an easy task, but it may be done, if one has luck, by boring a dozen holes in the parts to be united, then secure well and place about the break an abundance of filings of good pig iron, some wrought iron filings and also some of steel, says Mining and Scientific Press. Lute with fine clay and place in fire (before luting use any good flux, borax, etc.); heat until the filings melt and fill all the cavities. Let remain in the fire until fire goes out and the metal is cold; then remove and clean up.

SIMPLE DEFINITION OF COMPOUND ENGINE.

A compound engine is one having two or more cylinders, usually two, however, a high pressure cylinder and a low pressure cylinder, the latter being the larger. The steam from the boiler enters the high pressure cylinder and after performing a certain amount of work, it is exhausted into an intermediate vessel or cylinder, called a receiver, whence it is admitted into the low pressure cylinder; after performing a certain amount of work in this cylinder it is allowed to escape into the condenser, in a compound condensing engine, and into the atmosphere in a non-condensing engine.

A METHOD OF TEMPERING TAPS.

For tempering taps and knives and small springs, get a steam pipe of sufficient size length to accommodate the piece; heat one end and flatten on the anvil, and weld so it will not leak. Cut off sufficient length to take the tool to be tempered, says the American Blacksmith.

Then fill with lead and set up in the fire, melt it and bring to a red heat. Immerse the tool as soon as the lead is melted and let it remain in the solution until red. Then dip in salt water all over. When cool take out. Heat a large piece of iron to a red heat. Immerse the tool as soon as the lead is melted and let it remain in the solution until red. Then dip in salt water all over. When cool take out. Heat a large piece of iron to a red heat, grease the tool to be tempered with tallow, and take the hot iron, lay it on the anvil, and with a pair of nippers, hold the tap over the hot iron, turning until the desired color is obtained. Then drop it into linseed oil and you will have a good temper. This is the best way I have found to get a uniform heat, which is of much importance in tempering tools.

SPEED OF PULLEYS.

The diameter of the driven pulley being given to find its number of revolutions: Multiply the diameter of the driving pulley by its number of revolutions, and divide the product by the diameter of the driven pulley, the quotient will be the number of its revolutions.

The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time: Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of revolutions of the driven; the quotient will be its diameter.

To find the diameter of the driver: Multiply the diameter of the driven by the number of revolutions which it is required to make, and divide the product by the revolutions of the driver, the quotient will be the size of the driver.

In ordering pulleys observe the following data: Diameter of pulley; face of pulley; bore of pulley; whether crowning, or straight face; whether whole, or split pulley; whether for single, or double belt; whether keyed, or set-screwed; whether cast iron, wrought rim, or wood split pulley.

HINTS ON MACHINE DESIGN.

Draw something. Draw a straight horizontal line on a good-sized sheet of paper. I cannot recall a case in which the first line to be drawn was not a straight horizontal line. This line might just as well be drawn at once, without staring at blank paper for an hour, worrying about the tenth, eleventh or some other line. A drawing is a succession of lines. Every line drawn means one less to draw. When all the lines are drawn, all the work is done. These are simple, cold statements; but they constitute the analysis of every drawing. It is wonderful how helpful that first horizontal line is. It is like the first sketch; it gives you something to look at; and yet a detail draftsman, in taking up independent work, is quite liable to worry an hour over the possible or impossible results of drawing that line before he knows how his design is to proceed. Draw it. Draw something. Make a cross. Get something to look at. The next hundred lines will follow along quite easily, if you don't try to make your first draft too fine. Don't spend too much time over small details in the first draft, for it will have to be worked over anyhow. Quite likely, just as you are congratulating yourself on the advanced progress of your drawing, careful consideration will disclose a "snag" not previously thought of. Further study may show that your whole drawing is wrong, with the parts ill-proportioned. At such a time the young designer is apt to look at his work as all thrown away. As encouragement, I beg to again define the art of design: "Machine design is the successive elimination of snags." It takes some genius to discover a snag; it takes a successful designer to eliminate one. If there were no snags, anybody could design machines. Hence the definition.—C. L. Griffin in Am. Machinist.

ELECTRICAL EXPRESSIONS AND THEIR EQUIVALENTS.

The Practical Engineer for July publishes a table of electrical expressions and their equivalents, arranged for convenient reference, as follows:

One WATT	A RATE of doing work
	1. ampere per sec. at one volt
	.7373 foot-pounds per second
	44.238 foot-pounds per minute
	2654.28 foot-pounds per hour
	.5027 mile-pounds per hour
	.00134 Horse-Power
	$\frac{1}{746}$ Horse-Power
One KILOWATT	A RATE of doing work
	737.3 foot-pounds per second
	44238. foot-pounds per minute
	502.7 mile-pounds per hour
	1.34 Horse-Power
One HORSE-POWER	A RATE of doing work
	550. foot-pounds per second
	33000. foot-pounds per minute
	375. mile-pounds per hour
	746. watts
	.746 kilowatt
One WATT-HOUR	A QUANTITY of work
	2654.28 foot-pounds
	.503 mile-pounds
	1. ampere hour per one volt
	.00134 Horse-Power-Hour
	$\frac{1}{746}$ Horse-Power-Hour
One HORSE-POWER HOUR	A QUANTITY of work
	1,980,000. foot-pounds
	375. mile-pounds
	746. watt-hour
	.746 kilowatt hour
One AMPERE HOUR	A QUANTITY of current
	One ampere flowing for one hour, irrespective of the voltage
	Watt-hour volts
TORQUE	FORCE moving in a circle
	A force of one pound at a radius of one foot

There is a difference in "barrels" as applied to oil measurement. A barrel of crude petroleum is 42 gallons—5.6145 cubic feet; a barrel of refined petroleum 50 gallons—6.684 cubic feet.

Teacher: Johnny, can you tell me how iron was first discovered?" Johnny: "Yes, sir." "Well! Just tell the class what your information is on that point." "I heard pa say yesterday that they smelt it."

Two or three drops of ammonia on a lump of sugar may be eaten as a fair antidote for slight internal poisoning from cyanide. Peroxide of hydrogen is better for external cyanide poisoning. Bathe with a strong solution of soda and salt in warm water.

LEGAL NOTES.

A workman who fails to follow his instructions in the performance of his service, and is injured in consequence of such failure, is to be considered as guilty of negligence in contributing to his own injury. (93 Ill. App., 138.)

Knowledge on the part of a fellow-servant, who had charge of the work in hand, that a certain tool was defective, will not prevent a recovery from the employer, for an injury to an employe, caused thereby, since contributory negligence to defeat a cause of action must be that of the party injured. (86 N. W. Rep., 520.)

Where an unguarded shaft was so located that an employe must necessarily go out of his ordinary course, or one which he might be reasonably expected to take, in order to reach it, the employer is not required to guard the same. (86 N. W. Rep., 153.)

(The foregoing are general principles and are applicable in any state.)

WILL BE THE EXPOSITION'S PRIDE.

Machinery makers of the United States are taking a professional pride in making the Machinery building foremost in point of attractiveness at the Louisiana Purchase Exposition. They have aroused much interest among the manufacturers of France, Germany, England and other European nations and from present indications the Machinery building is to be the very greatest thing at the great show. In this building is to be installed the great power plant which is to furnish power for the entire exposition city. The plant is to be 22,000 horse-power. Director of Exhibits Frederick J. V. Skiff, said:

"The chief in his contract with machinery people, finds that the granting of free power and space appeals not only to exhibitors but to the general public in a forceful way. The people see," he says, "that we are not asking for national and state appropriations and then exacting fees from the very class for the special benefit of which the exposition professes to organize and theoretically exist."

Summer Course in Easy Mechanics For Boys.

By Wilbert S. Drew.

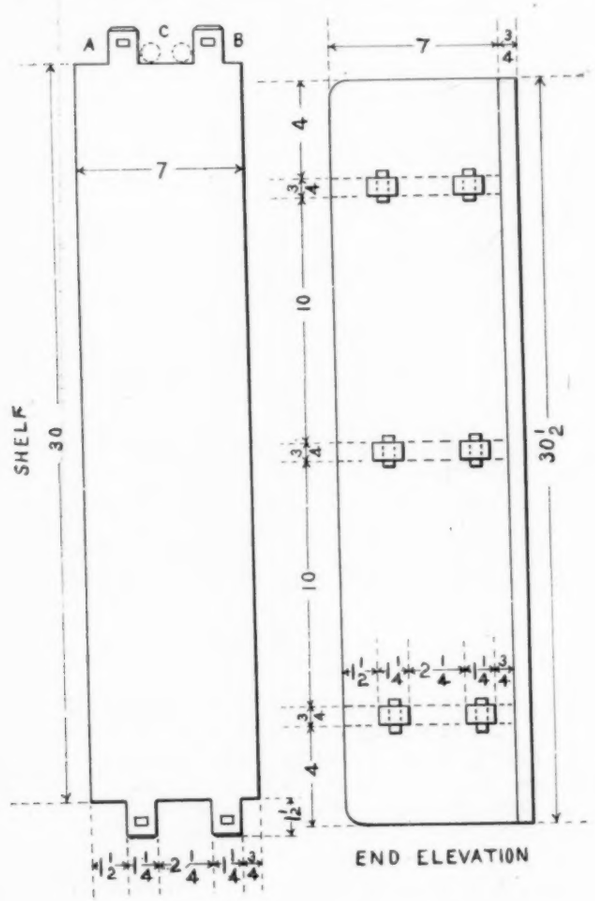
[This series, commenced in issue of June 28, will continue each week. It will give instructions which any boy can understand, how to use carpenter's tools and make things. In doing this only a few tools will be required, and cost of material will be small. The articles to be made will include a boat, table and similar subjects.]

MAKING A BOOK CASE.

The material for this case should be ¾-inch thick and may be any kind of hard wood, filled, rubbed down and polished as explained in a previous article, or it may be white wood, stained and varnished, or pine, painted any color that suits the room in which it is to be placed.

There will be two side pieces like the one shown by the end elevation and three shelves. The back may be made in three pieces and should be held in place by flat headed screws.

First get out the two end pieces. Plane their edges exactly square and straight, then lay out the six mortises on each piece, being careful to get them of exact size and in the positions shown by the drawing. It will be well to lay out the lines on both sides of the pieces, as it is necessary to mark from both sides to avoid splitting off the corners. Use knife lines entirely;



they give more accurate results than can be obtained with a pencil.

Place one of the pieces on the bench and see that it rests firmly at the mortise to be cut, with no chips or dirt under it. Chisel out the mortise by holding the chisel in a vertical position, its flat side toward the line and at least 1-16 inch away from it so as to leave that amount for finishing after the hole has been cut through. The chisel should cut across the grain of the wood and not with the grain. Make a series of cuts about 1-16 inch apart by striking the handle of the chisel with a mallet. Light blows will be sufficient, and when these cuts have been made nearly across the mortise, turn the chisel around so that its flat side faces the other way. This is to insure a square corner on the work. Now the wood between the cuts may be removed quite easily by holding the chisel with its beveled edge down and tapping with the mallet. Do not strike a heavy blow, as this might drive the chisel too far and split off the corners of the work.

The mortise may now be about ⅛ inch deep. Repeat the above operations until it is carried half way through the piece; then turn the work over and begin in the same way on the

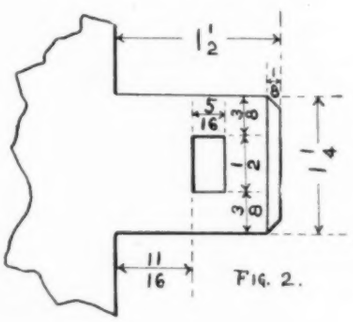


FIG. 2.

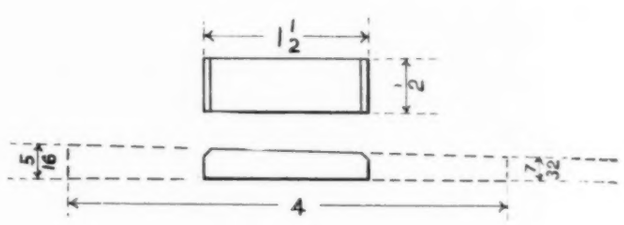


FIG. 3.

other side and cut through the remaining distance. Now hold the piece in the vise and carefuly finish out the sides all around, cutting half way through, first from one side of the piece and then from the other side.

The twelve mortises finished, get out the three shelves, each 33 inches long and 7 inches wide, and lay out all the lines at each end like the drawing and cut the small mortises for receiving the keys shown in Fig. 3. The spaces marked A and B may then be cut out with the fine saw. To cut out the space C, first bore two ¾-inch holes shown by the dotted circles, saw down the sides with the fine saw and cut out between the holes with a key-hole saw; or this space may be cut out just as in making a mortise, with mallet and chisel. In boring the holes run the bit in until the spur just comes through; then back the bit out and finish boring from the other side. This prevents the edges of the hole from splitting out when the bit comes through.

Fig. 2 gives a full size view of one of the tenons with its small mortise for receiving the key shown in Fig. 3. It will be noticed that the mortise is placed only 11-16 inch from the end of the shelf. This is done in order to leave 1-16 inch space between the key and shelf so that the latter may be drawn tightly to its place.

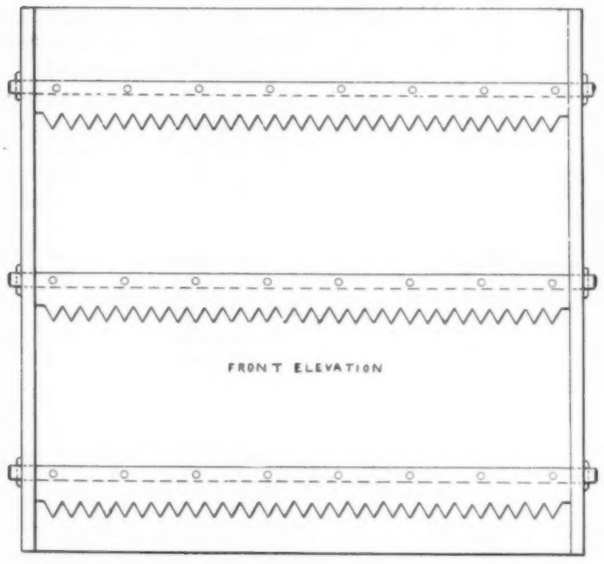
This gives a very strong construction and admits of the case being readily taken apart and packed away in a small space when moving.

The ends of the tenons should be beveled off for ⅛ inch all around as shown in Fig. 2.

The shelves may now be put into place and the keys, shown

in Fig. 3, fitted. These keys shoud be made as shown by the dotted line, driven lightly into place and marked so that they will project ⅜ inch on each side of tenon, then taken out and cut to size and the outer upper and lower corners beveled off as shown, after which they should be replaced.

The back is next screwed on, care being taken to have at



Book Case Completed.

least three screws in each shelf to keep them from sagging. The holes for the screws should be countersunk so that the heads may be slightly below the surface of the wood when they are in place.

A countersink to fit your bit-brace may be bought for a few cents at the hardware store.

Sandpaper the case all over with fine sandpaper held over a block of wood and it is now ready to finish by staining, polishing or painting.

If a strip of red or green felt about two inches wide, having its lower edge pinked or cut in points, is tacked along each shelf with brass headed tacks it will add to the appearance of the case and assist in keeping dust from settling on the tops of the books.

HINTS ON MELTING BRASS.

The following points were made by Chas. Vickers of Chicago, in an address before the Boston meeting of the American Foundrymen's Association:

Compared with steel or iron it is an easy matter to melt brass. It is often melted on a small scale in an ordinary stove. Great waste of fuel occurs in using a 30-inch pot in a furnace intended for a 100-inch. Three inches of solid fuel should surround the pot, and will do the work of six or more. Tossing metal into the pot causes great waste by splashing. Be sure the molds are ready by the time the metal is ready to pour—costs money to "hold" a pot in furnace. Never allow your furnace to become barrel-shaped; stranght sides are best. Gas in the shop is often caused by the furnace flues being too small; rather than the main flue. A fan in the main flue is good. When sheet iron is used for main flue it must be suspended and not allowed to touch the wall. Do not cover flues with asbestos to protect workmen from the heat; hang a curtain of asbestos, but do not let it touch the flue.

It cost $9,936,001 to repair the transports rented and purchased and used in the war with Spain. Now, what do you suppose that $1 went for?

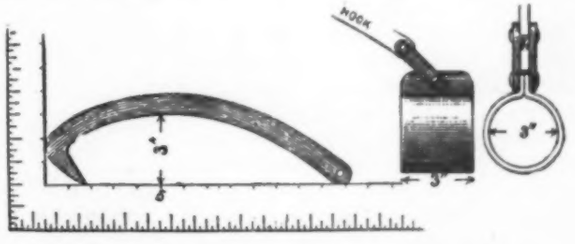
WILL THIS CHANGE ALL SHIP RUDDERS?

An Accident to the Deutschland Leads to an Important Discovery.

Have shipbuilders for years past been making the ship's rudder too large? If so, no man can estimate the thousands of tons of coal which have been wasted on our ocean steamer lines. The American Shipbuilder describes the discovery made by the late Capt. Albers, of the Deutschland, who died suddenly while on his last voyage to Hamburg. While the speed of the Deutschland under the most favorable conditions had never before exceeded twenty-three and a half knots, Capt. Albers observed upon this last voyage that she was logging twenty-five knots an hour, and for a full day was consistently maintaining that extraordinary speed. Investigation into the causes disclosed the fact that the vessel had lost all but a small portion of her rudder, and that thereby a considerable surface of resistance to the sea had been done away with. The result of this loss of resistance had been an increase of speed to the extent of, on an average, two knots an hour, and with no added expenditure of energy or coal consumption. In other words, a large vessel of the Deutschland's capacity, with a smaller rudder, it would seem to have been proven, could, without added expense, shorten in time the distance betwen port and port by something like 200 miles. When in addition to this fact it was found that on the high sea the vessel was easily directed by the use of the twin-screws for steering purposes, and that in the harbor and narrow waters of any port so huge a vessel could be steered with the assistance of the propellers, by a rudder which was a mere shadow of its former self, a principle seemed to be established which may work a revolution in the construction of the steering gear of our ocean greyhounds. There may prove to be, on further consideration, serious objections to the changes which the incident suggests, and what chance has appeared to demonstrate may in the cold light of reason and of experiment prove to lack permanent value, but the episode is an interesting one. If it proves of enduring value it will not be the first time that sheer accident has resulted in the discovery of principles of great scientific importance, as well as of practical commercial value.

ROUGH AND READY CANT HOOK.

To make a cant-hook for rough use the accompanying sketch and description will enable one to be furnished of home manufacture, says the Mining and Scientific Press. The hook is made of steel ½ x 1 inch, 15 inches long. A hole is punched in one end and a marl point is made on the other and bent to the inside of a square so that at 5 inches it is 3 inches from the square, and the marl point turns in 1¾ inches, as shown in the accompanying sketch. In the sketch is also the band, which is



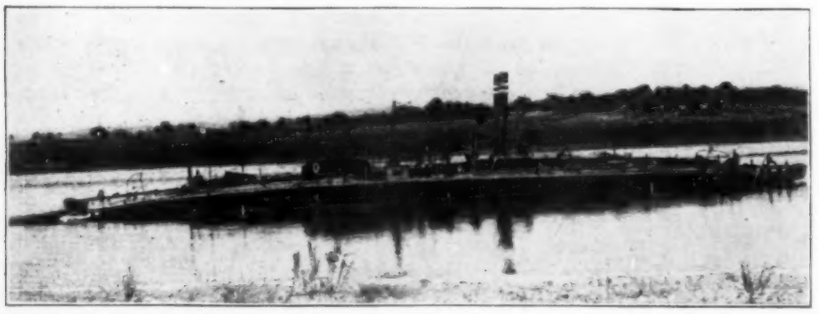
made 3 inches wide and as large as is wanted for the lever. A hole is punched in each end and the ends are brought together and riveted inside two straps, which are ⅜ x ⅝-inch iron. They are then heated and worked until they are loose so as to make a double hinge. This cant-hook will do good work on any size log or square lumber.

A dozen or more patents are granted each week on golf balls; voting machines and non-refillable bottles are also much in evidence.

LONGEST CHAIN IN THE WORLD.

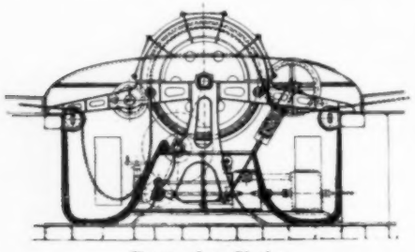
290 Miles in Length.—By Its Help Steamboats Ascend Rapids.

A curious means of moving boats is employed on the river Elbe, and described by U. S. Consul Cole, of Dresden. A chain 290 miles long lays at the bottom of the stream which is too swift to navigate



Chain Boat on the Elbe.

in the usual way. The boats are 180 feet long and provided with 200-horse-power steam engines which turn a drum fastened on the deck. The chain comes in over the bow, passes along on rollers to the drum, around which it is wound three times. The



Drum for Chain.

chain is then carried to the stern, where it drops back into the water. The steamers tow five barges containing 1,500 tons.

On the return trip the chain is dispensed with, the swift current and an ordinary screw propeller affording a quick passage.

FORTUNES IN GROWING CASSAVA PLANT.

Something of a sensation in the agricultural world is created by recent discoveries of the wonderful possibilities of cultivating the Cassava plant in the South. That it will open up a new and lucrative commercial pursuit for the South there is little doubt.

The plant thrives best in the "piny woods" belt of the Gulf states. Besides its production of tapioca it is said to produce more starch per acre than any other plant known. The starch is said to be 4½ times as effective for laundry purposes as the finest starch made from wheat, while the latter costs a quarter more per pound. The Cassava was brought to Florida some years ago from tropical lands and has considerably improved by transplanting. It grows to a height of five or six feet, requires about seven months to reach maturity and withstands drought well. It is sensitive to frosts, however, and can not bo grown much above the north line of Florida. Its valuable parts are its roots, which are from one to three inches in diameter and from one to three feet long. Their texture is white, solid, and harder and drier than that of the potato. The root is also an excellent food for sustaining and for fattening cattle, sheep and hogs.

SMALL GASOLINE ENGINE TURNS BIG LOCOMOTIVE.

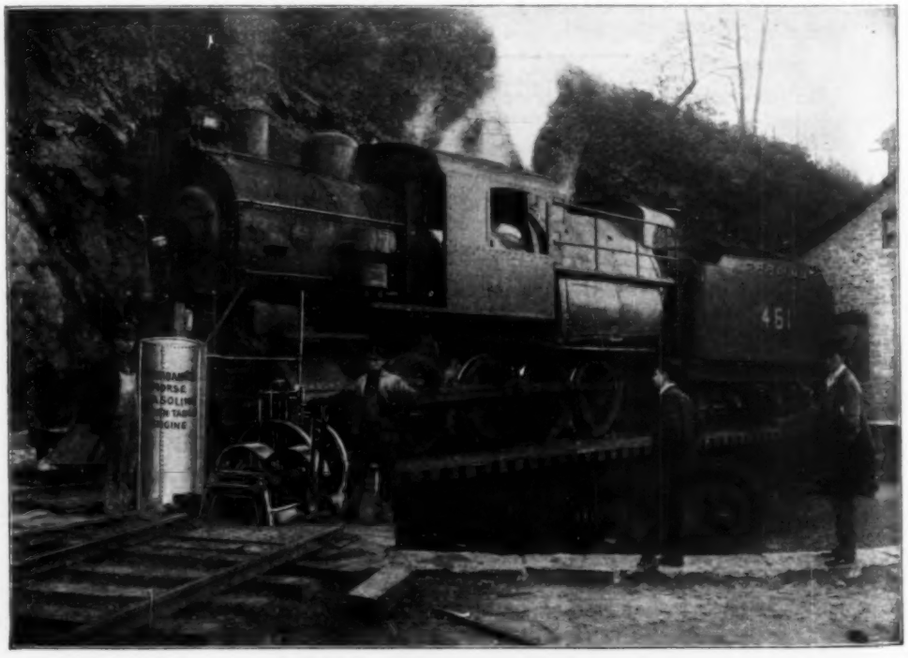
Who has failed to stop and watch the workmen pushing on the long wooden handles to turn a big locomotive on its turn-table. So evenly balanced are these tables that often two men can turn a 40-ton locomotive, and four men move the 100-ton giants. But this takes time and strength, and now the railroads are putting in power to do the turning. The gasoline engine and its tank are set on the platform of the table and carried around as the table turns. The motor drives a gear which engages an endless rack extending around the side of the pit. One man operates the machine.

A BOON TO THE BUSY MAN.

The Atlanta Constitution says: "This new weekly journal, published in Chicago, gives in a very readable and comprehensive way the newest and most interesting accounts of the mechanical progress of the world. Profusely illustrated, elegantly printed, it gives a weekly digest that is a boon to the busy man whose interests are up to date, but whose waking hours are too absorbed in active affairs to devote much time to delving after details. Popular Mechanics comes to his relief in a very agreeable and instructive way."

ABOUT WATER'S FREEZING.

It used to puzzle all thinking people why ponds and rivers do not freeze beyond a certain depth. This depends on a most curious fact, namely, that water is at its heaviest when it reaches 40 degrees Fahrenheit, that is, eight degrees above freezing point. On a frosty night, as each top layer of water falls to 40 degrees its sinks to the bottom; therefore, the whole pond has to drop to 40 degrees before any of it can freeze. At last it is all cooled to this point, and then ice begins to form. But ice is a very bad conductor of heat, therefore it shuts off the freezing air from the big body of comparatively warm water underneath. The thicker it gets the more perfectly does it act as a great coat, and that is why even the Arctic Ocean never freezes beyond a few feet in thickness.



Turntable Operated by Gasoline Engine.

River Steamers for Africa

For navigation on African rivers specially constructed steamers are required. At certain seasons many rivers become very shallow, and the boats must be light and draw as little water as possible. We illustrate several interesting types of these boats, which were built by the Thornycroft company, of London.

Fig. 1 shows one of the patrol boats for the Nile, which were first built for the relief of Khartoum. These boats are 140 feet long, have 360 horse-power and travel 12½ miles an hour. They draw only 1 foot 10½ inches of water. The mounted guns are seen on the upper deck; below are the bullet-proof cabins with firing holes.

Fig. 2 is the missionary steamer "Goodwill," built for the Congo river. It is 84 feet long, has 58 horse-power and travels 10½ miles an hour.

Fig. 3 is another military boat, for the Nile. It is the gunboat "Melik" and is 145 feet long. She has 457 horse-power, draws two feet and has a speed of 14 miles. Large guns are mounted fore and aft, and protected firing rooms are placed on both decks and around the wheel house. It carries a powerful searchlight, and is a very effective fighting machine.

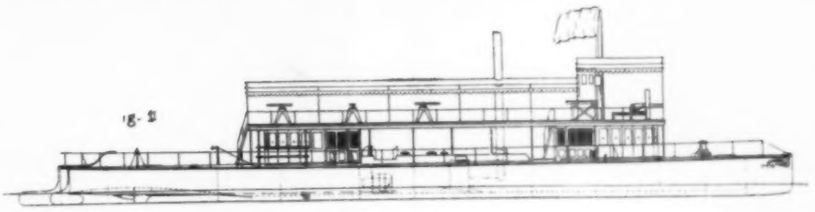


Fig. 1

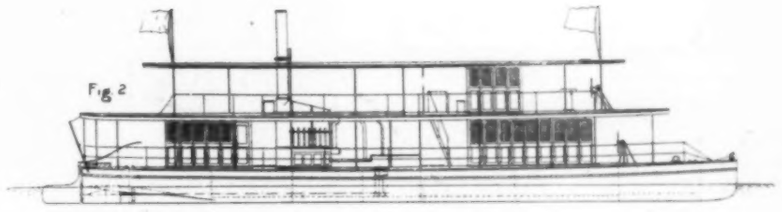


Fig. 2

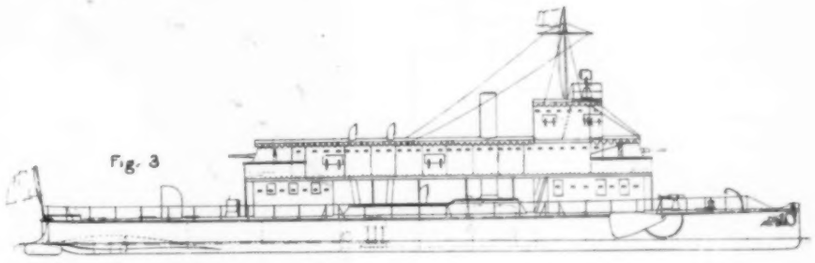
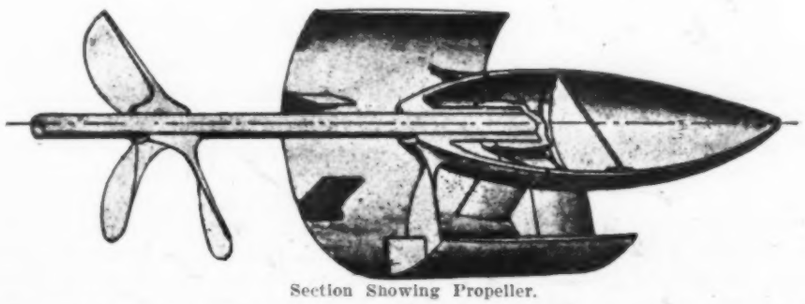


Fig. 3

The arrangement of the propeller screw is unusual. In order to clear the bottom in shallow water the screw does not reach below the keel of the boat. It is really a "screw turbine" and is generally placed in a tunnel under the bottom, the upper part of the tunnel rising above the surface of the water, so that a portion of the diameter of the propeller is above the water level when the boat is at rest. As soon as the engines are started water is drawn up into the tunnel and air expelled by the action of the propeller which then works completely submerged. An air tight door is placed at the crown of the tunnel immediately over the propeller, which can be opened from inside the boat. The admission of air to the tunnel causes the water within it to fall to the level of the outside water surface and leaves the propeller partially exposed. It can then be examined and cleared if it should have become fouled, and with twin screws this operation can be performed upon one propeller without stopping the other.



Section Showing Propeller.

ORIGIN OF THE LITTLE NICK ON COAT LAPELS.

All men wear coats and all coats have little V-shaped nicks at the juncture of the coat collar with the lapel, yet there are very few men who know how the little nick chanced to be there. The style had its origin in France, as do many styles at the present day. The coat lapel with the nick in its windings was supposed to describe the letter M. Notice your coat when buttoned and see even now if the lapel doesn't look like an M on its side. The M was in honor of Moreau, and was the secret insignia of his followers, by which they might distinguish each other.

It was at the time when Napoleon gave way to his ambition and tried to implicate Moreau in Pichegru's conspiracy. Moreau had been Napoleon's superior and he was very popular, but his followers dared not openly assert themselves at this time, when Napoleon had attained superior power, for fear the latter's disapproval. So Moreau's admirers agreed to nick their coat lapels that they might know each other and be distinguished from the followers of Napoleon.

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AN ARTISTIC GROUP OF STATUARY.

"Weaving," one of the most artistic of the five groups of statuary that are to adorn the Textile Arts Building of the Louisiana Purchase Exposition, is to occupy a conspicuous position on one side of the entrance. All the groups were designed by Robert Bringhurst. The central figure in the group, which is herewith illustrated, presents the laurel of Victory, while at her feet two youths are pointing out the marvelous pattern in the finished fabric.

The interesting illustration of the steamship City of Rome which appeared in our issue of July 5th should have been credited to the American Shipbuilder, which excellent journal contains a complete description of this ocean liner. By mistake we credited another publication.

The electric light company at Dallas, Texas, are saving $2,000 a month by burning oil instead of coal. The Southern Pacific saved $16,000 in one month on 39 locomotives.

To Whom It May Concern:

I have opened an office at Rooms 1520-21 Marquette Bldg., 204 Dearborn St., Chicago, for securing Patents, Trade-marks and Copyrights in the United States and Foreign countries.

Having been actively engaged in practice before the Patent Office at Washington, D. C., and the United States Courts since 1881, during which time I have conducted nearly one thousand patent cases, I feel qualified to offer my services to those who are interested in patents as inventors, investors and manufacturers. My office in Washington will be retained in charge of a competent associate, so that clients will have the advantage of direct representation at the Patent Office as well as of personal consultation with their attorney. After patents are obtained, I will assist clients in disposing of their patent rights to the best advantage.

Books on Patents, and references will be furnished upon request

Respectfully,

FREDERICK BENJAMIN,
PATENT ATTORNEY AND SOLICITOR.

Telephone, Cent. 520.

TOLD TO A YOUNG MARINE.

This is the tale that was told to me
By a battered and shattered son of the sea;
To me and my messmate, Silas Green,
When I was a guileless young marine.

'Twas the good ship Gyascutus,
All in the China seas,
With the wind a lee
And the capstan free
To catch the summer breeze.
'Twas Captain Porgie on the deck,
To the mate in the mizzen hatch,
While the boatswain bold in the for'ard hold
Was winding his larboard watch.

"Oh, how does our good ship head to-night?
How heads our gallant craft?"
"Oh, she heads to the E. S. W. by N.,
And the binnacle lies abaft."

"Oh, what does the quardrant indicate?
And how does the sextant stand?"
"Oh, the sextant's down to the freezing point
And the quadrant's lost a hand."

"Oh, and if the quadrant's lost a hand
And the sextant falls so low,
It's our body and bones to Davy Jones
This night are bound to go."

"Oh, fly aloft to the garboard-strake,
And reef the spanker boom;
Bend a studding sail on to the martingale
To give her weather room."

"Oh, boatswain, down the for'ard hold,
What water do you find?"
"Four foot and a half by the royal gaff,
And rather more behind."

"Oh, sailors, collar your marlinspikes
And each belaying pin;
Come, stir your stumps to spike the pumps,
Or more will be coming in."

They stirred their stumps; they spiked the pumps;
They spliced the mizzen brace;
Aloft and alow they worked, but oh!
The water gained apace.

They bored a hole below her line
To let the water out;
But more and more, with awful roar,
The water in did spout.

Then up spoke the cook of our gallant ship—
And he was a lubber brave—
"I've several wives in various ports,
And my life I'd like to save."

Then up spoke the captain of marines,
Who dearly loved his prog:
"It's awful to die, and it's worse to be dry;
And I move we pipes to grog."

Oh, then, 'twas the gallant second-mate
As stopped them sailors' jaw;
'Twas the second mate whose hand had weight
In laying down the law.

He took the anchor on his back
And leaped into the main;
Thro' foam and spray he clove his way,
And sunk and rose again.

Thro' foam and spray, a league away,
The anchor stout he bore;
'Till safe at last, he made it fast,
And warped the ship ashore.

'Taint much of a deed to talk about,
But a ticklish thing to see,
And something to do, if I say it, too--
For that second-mate was me!

This is the tale that was told to me
By that modest and truthful son of the sea.

And I envy the life of a second-mate,
Tho' captains curse him and sailors hate;
For he ain't like some of the swabs I've seen
As would go and lie to a poor marine.

—Coast Seaman's Journal.

JESSE JAMES' CASKET CRUMBLES IN TWENTY YEARS.

Metallic Coffin, When Exhumed, Found to Have Crumbled to Pieces From Corrosion.

The curious effect of the earth on metallic caskets was revealed in the disinterment of the remains of Jesse James, on the old Samuels' farm, near Kansas City, last week. The body was transferred from the front yard of the Samuels' home to Southpark Cemetery at Kearney. The remains were exposed to the light of day after a lapse of 20 years. It was found that the metallic casket in which the bandit had been interred had gone entirely to pieces, from the corrosive influences of the damp earth, while the head and face maintained a surprisingly good state of preservation. The skin was drawn taut over the face of the outlaw captain, leaving the features plainly recognizable. The head was turned to one side revealing the wound made when Bob Ford sent a bullet through the bandit's brain, in April, 1882. A new metallic casket was provided, and in this the body was placed for reinterment.

There were present at the ceremonies, Mrs. Zeralda Samuels, mother of Jesse James; Frank James, his brother; Jesse James, Jr., his son; six pallbearers, and about 50 veterans of the Quantrell band, who had been comrades of the dead man, besides about 500 visitors who had assembled to get a farewell view of the remains of the world's most notorious bandit.

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